XX. *Notes on the Vegetation of Buenos Ayres and the neighbouring districts.*

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The principal materials of the following notes are derived from the very extensive botanical collections of the late Mr. Fox, formerly British Minister at Buenos Ayres, and afterwards at Rio de Janeiro. The herbarium formed by Mr. Fox in the neighbourhood of the former city, as well as at Monte Vidco, Maldonado, and other localities on the northern shore of the Rio de la Plata, and along the lower part of the river Uruguay, during the years 1831, 1832 and 1833, is so considerable, that I am inclined to think it may be viewed as representing a great part of the vegetation of those countries, and may afford sufficient ground for the remarks which I propose to make on its leading characteristics. In a residence of about a month at Buenos Ayres, in the beginning of 1834, I had myself the opportunity of becoming acquainted with the most prominent features and general aspect of the vegetation. The principal published works from which I have derived assistance, are M. Auguste de Saint Hilaire's Report of his Travels in Southern Brazil (published in the Mémoires du Muséum, vol. ix.), and the papers by Sir William Hooker and Dr. Walker-Arnott on the plants of Extra-tropical South America, in the 'Botanical Miscellany' and 'Journal of Botany.' I am indebted to Sir W. Hooker also for very important assistance in naming the species contained in Mr. Fox's collection.

The region of which I propose chiefly to treat, is that lying on both banks of the Rio de la Plata, and on the lower part of the courses of the two great rivers by whose junction it is formed; comprising consequently those parts of the republics of Buenos Ayres and Banda Oriental which lie nearest to the Plata, between the parallels of 33° and 35° S. lat. The collections before me were formed in the neighbourhood of the coast and of the rivers, so that I am obliged to rely upon other authorities for the botanical characteristics of the interior of those countries, in which, indeed, according to such information as I can procure, a considerable degree of uniformity seems to prevail. I shall introduce also some remarks on the vegetation of the southernmost part of Brazil, a district in which Mr. Fox made large collections, and which forms a connecting link, botanically as well as geographically, between the country I chiefly treat of, and the tropical parts of the same continent.

The Rio de la Plata, which, even as far up as Buenos Ayres, is between twenty and thirty miles wide, forms a strongly marked *geological* boundary, separating two widely extended and very dissimilar formations. All its northern shore is composed of crystalline rocks,—granite and gneiss, and their various modifications,—which range from thence to the northward, uninterruptedly, through many degrees of latitude, constituting the whole coast of Brazil to far within the tropic; it is said, even to Bahia. On the south of

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the great river, nothing is seen but tertiary formations of a very late date: first, the mud and marl of the Pampas, and further south, the gravel and shingle of Patagonia. So absolute is the line of demarcation, that, while on the northern bank of the river the granitic rock is perpetually showing itself on the surface in low rocks and hillocks, on the south bank not a stone nor a pebble is to be found, and all the stone used at Buenos Ayres, for paving and other purposes, is brought from across the river. But, notwithstanding this remarkable difference in the geological structure of its two banks, the Plata does not form a *botanical* boundary-line. There are indeed several species of plants which are confined to one or the other side, and some families, principally tropical, which do not cross it; yet the leading characteristics of the vegetation, both as to its general physiognomy and its prevailing forms, are the same on both sides. The whole country, therefore, from the frontier of Brazil southward, as far as the Pampas vegetation extends (or to the border of Patagonia), may be considered as one botanical province, which, for the sake of convenience, I shall provisionally call the *Argentine* Region, from the name of the great river.

The botanical characteristics of this region are well marked. The most striking peculiarity of its physiognomy is the almost entire absence of trees, and the scarcity even of shrubs, except along the banks of the principal rivers. Every one who has come from Rio de Janeiro to Monte Video and Buenos Ayres has been struck with the contrast between the gigantic vegetation of Brazil, and the bare, treeless, almost barren character of the shores of the Plata, where the cultivated poplars, and the flower-stems of the Agave, and here and there a solitary *Ombù* tree (*Phytolacca dioica*), are the only objects that relieve the nakedness of the country. Yet the vegetation along the river-side, at least near Buenos Ayres, may almost be called luxuriant in comparison with that at a short distance inland. It is not that the vegetable covering of the soil is really scanty or meagre, but the vast majority of the plants which compose it are herbaceous, of low growth, and for the most part not very conspicuous. This treeless character of the country has been forcibly described, and its possible causes most ably discussed, by Mr. Darwin, in his 'Journal.' The immediate banks of the Uruguay and the Paranà, however, and the islands in those rivers appear to be wooded, though not with trees of great height or size.

As compared with the vegetation of Brazil, that of the Argentine region is distinguished not only by the predominance of herbaceous plants, but (as might be expected) by the diminished numbers of tropical families, and also by something of a more European physiognomy. I cannot, however, think that this resemblance of the Argentine to the European flora is as great as it has been represented by some celebrated botanists. The resemblance appears to me partly fallacious, occasioned by the abundance of *naturalized* European plants; and, excluding these, to consist rather in a certain general similarity of outward appearance than in a real botanical analogy.

Schouw, indeed, (as quoted by Meyen in his 'Geography of Plants,') says that, "out of 109 genera which belong to Buenos Ayres, 70 appear in Europe;" and St. Hilaire, a very high authority, states that, of 500 species collected by him in the Banda Oriental, between the mouth of the Plata and that of the Rio Negro, a tributary of the Uruguay,

only 15 belonged to families completely strangers to Europe. These statements are doubtless accurate, as far as they go; but the vegetation of those countries is in reality more different from the European than such comparisons would seem to imply. For, in the first place, many of the families and genera of plants which especially predominate in the Argentine region, and are strikingly characteristic of it, are such as are but scantily represented in Europe, or make no conspicuous figure here. Such are, in particular, the families of *Solaneæ*, *Verbenaceæ*, *Amaranthaceæ*, and, perhaps I may add, *Malvaceæ*. Such is the genus *Solanum*, of which many more species grow wild within a short walk of the city of Buenos Ayres, than in the whole of Europe; such is the genus *Verbena*, so insignificant in our continent, but playing so conspicuous a part in the Argentine vegetation, by the number of species, the profusion in which they grow, and the beauty and brilliancy of many of them. I may add also the genus *Eryngium*, or at least that curious section of it which is characterized by narrow and parallel-veined leaves.

Secondly, although the genera altogether wanting in Europe may not form, numerically, a very large proportion of the Argentine flora, yet several of them are very conspicuous, and play an important part in that flora by the number of species or of individuals. Such are *Pontederia*, *Gomphrena*, *Teleianthera*, *Jussiæa*, *Nicotiana*, *Petunia*, *Nierembergia*, and others.

Thirdly, on the other hand, several of the families of plants which most abound in Europe, are nearly wanting, or but very feebly represented, (if we exclude naturalized plants,) on the shores of the Plata; such are *Cruciferæ*, *Caryophylleæ*, *Umbelliferæ* (excepting *Eryngium*), *Borragineæ*, *Dipsaceæ*, and two of the primary divisions of *Compositæ*, namely the *Cichoraceæ* and *Cynareæ*.

In the collections in my possession from Buenos Ayres and the Banda Oriental, I find fourteen families and 102 genera which are not European. The families are:

Commelynaceæ,	*Marantaceæ*,	*Passifloreæ*,	*Buttneriaceæ*,	*Tropæoleæ*,
Pontederaceæ,	*Calyceraceæ*,	*Loaseæ*,	*Malpighiaceæ*,	*Melastomaceæ*.
Bromeliaceæ,	*Bignoniaceæ*,	*Begoniaceæ*,	*Sapindaceæ*,	

The *genera* wanting in Europe are the following:

Paspalum.	*Sisyrinchium.*	*Vernonia.*
Stenotaphrum.	*Cypella.*	*Stevia.*
Cenchrus.	*Alstrœmeria.*	*Baccharis.*
Aristida.	*Tillandsia.*	*Pterocaulon.*
Chascolytrum.	*Oncidium.*	*Haplopappus.*
Pappophorum.	*Canna.*	*Flaveria.*
Eustachys.	*Spathicarpa.*	*Porophyllum.*
Eleusine.	*Roubieva.*	*Leighia.*
Androtrichum.	*Gomphrena.*	*Verbesina.*
Commelyna.	*Teleianthera.*	*Achyrocline.*
Hydrocleis.	*Pupalia.*	*Trixis.*
Pontederia.	*Iresine.*	*Mitracarpum.*
Herreria.	*Acicarpha.*	*Cephalanthus.*
Udora.	*Boopis.*	*Asclepias.*

Gomphocarpus.
Oxypetalum.
Araujia (*Physianthus*, Mart.).
Philibertia.
Schistogyne.
Lantana.
Calonyction.
Nicotiana.
Nierembergia.
Petunia.
Jaborosa.
Himeranthus.
Cestrum.
Buddlea.
Scoparia?
Herpestes.
Dicliptera.
Bignonia.
Argemone.
Passiflora.
Blumenbachia.
Begonia? (There is some doubt about the locality of the specimens of this.)
Pavonia.
Sida.
Abutilon.
Buttneria.
Stigmaphyllon.
Heteropterys.
Paullinia.
Croton.
Phyllanthus.
Schinus.
Chymocarpus.
Jussiæa.
Heimia.
Cuphea.
Eugenia.
Chætogastra (*Arthrostemma*, DeC.).
Mimosa.
Desmanthus.
Inga.
Calliandra.
Acacia.
Parkinsonia.
Cassia.
Poinciana (perhaps introduced?).
Crotalaria.
Indigofera.
Tephrosia.
Daubentonia.
Desmodium.
Æschynomene.
Clitoria.
Camptosema.
Canavalia.
Galactia.
Vigna.
Erythrina (*E. Crista-galli*, perhaps introduced at Buenos Ayres).
Rhynchosia.
Machærium.

Such estimates are of course liable to some variation, according to the different opinions entertained by different botanists as to the limits of genera. In the above list I have taken Endlicher's 'Genera Plantarum' for my guide.

The above observations will show how materially the Argentine Flora differs, in reality, from that of Europe. What principally contributes to give it, at first sight, a European aspect, is the great number and extraordinary prevalence of *naturalized* European plants,—plants evidently introduced in the first instance by accident, and which, being of a hardy constitution, and possessing efficient means of propagation, have spread so rapidly as to cover the soil to a great extent, and actually to predominate over the native growth. No small proportion of the plants which a stranger will observe in his first rambles in the neighbourhood of Buenos Ayres are colonists from our quarter of the globe. The fallow fields about that city are blue with *Echium violaceum*; the banks of earth are covered with the common Fennel; the ditch-sides and waste ground are overrun with *Chenopodium album*, *Sonchus oleraceus*, and *Xanthium spinosum*; *Trifolium repens* and *Medicago denticulata* form much of the herbage near the river-side; and among the most common grasses are *Lolium perenne* and *multiflorum*, *Hordeum murinum* and *H. pratense*. What is more remarkable, these intrusive strangers are not confined to the cultivated lands or to the neighbourhood of the city, but have spread far and wide over the open plains. The "thistles" and "clover" which clothe the Pampas of Buenos Ayres for leagues and leagues together, have been described by many travellers; they are *Carduus Marianus*, *Cynara Cardunculus*, and *Medicago denticulata*, all of them European species. The two former have spread themselves also over the country north of the Plata, where M. de St. Hilaire found them covering wide tracts of country. It would seem that these temperate regions of South America are peculiarly favourable to the growth of European plants, and that

none of the native ones possess so hardy a constitution, or such powers of propagation, as these strangers. It is, as Mr. Darwin remarks, a parallel case to that of the horse and ox, which have, within the last three centuries, spread themselves in such countless numbers over the same countries.

It appears to me that this wide diffusion of naturalized plants, originally foreign to the country in which they now grow, bears in some degree upon the question of *specific centres*; or at least is adverse to the views of those who consider the natural distribution of species as determined solely by favourable local circumstances. These introduced plants have established themselves so readily and so completely, that it is quite evident, the soil, climate, and other circumstances affecting their distribution, must be highly favourable; yet they did not exist in those countries until introduced by the indirect agency of man. Therefore it would seem that they were not created indiscriminately in all the situations naturally adapted to their constitutions. But the general question of the distribution of plants is too wide for me to enter further upon it in this place.

The *social* character which is so eminently conspicuous in many of the naturalized plants above noticed is not confined to them, but is observable also, though in a less degree, in several of the indigenous plants of the Pampas of Buenos Ayres. The most remarkable in this respect, as far as I observed, are *Verbena erinoides* and *chamædrifolia*, *Mitracarpum Sellovianum*, and a dwarf *Solanum*; besides a few grasses, which, as they were not in flower at the time of my visit to Buenos Ayres, I could not determine. This social growth of some particular plants, and consequent uniformity of vegetation, has, I think, been noticed by various naturalists as characteristic of extensive plains.

Tropical forms of vegetation are not wanting in the Argentine region, but occur chiefly on the banks and islands of the principal rivers, much more rarely in the open country. They are principally woody climbers, such as *Passiflora cærulea*, *Stigmaphyllon littorale*, two or three species of *Paullinia*, a *Cardiospermum*, and a *Bignonia*; or *Leguminosæ* of a tropical character,—species of *Mimosa*, *Inga*, *Calliandra*, and *Cassia*. Of the *Melastomaceæ*, a family so eminently characteristic of tropical South America, and especially of Brazil, one solitary species (an *Arthrostemma*) reaches to the north bank of the Plata, but does not cross it. Colonia, opposite to Buenos Ayres, seems to be the most southern locality of that beautiful order. One *Machærium*, a very tropical form, grows in the islands of the Uruguay, near its mouth, and is probably the most southern representative of the *Dalbergia* tribe of *Leguminosæ*. A few Monocotyledonous genera which have their head-quarters within the tropics appear for the last time, as we go southwards, on the banks of the Plata; such are *Canna* (of which there is one species at Buenos Ayres), *Oncidium*, and *Tillandsia*.

Of the range of *Palms* in the region in question I have no knowledge. It would appear from Mr. Darwin's statements, that they occur here and there as far as 35° S. lat., which seems to be likewise their southern limit in Chile.

The southern limit of the Argentine vegetation seems to be determined mainly by soil; the northern, by climate alone. To the south its extension seems to depend upon that of the Pampean formation; that is to say, where the calcareous mud and marl of the Pampas are succeeded by the arid gravel or shingle of Patagonia, the character of the vegeta-

tion also changes. The Rio Colorado, in S. lat. 40°, was observed by Mr. Darwin to form a pretty accurate boundary-line between these two formations; and he notices* the change in the vegetable covering of the soil accompanying this change in its mineral nature. The herbaceous vegetation which clothes the surface of the Pampas pretty uniformly is succeeded by low scraggy thorny shrubs and dry meagre grasses, which, according to the accounts we possess, are so thinly scattered over the shingly plains of Patagonia, that the aspect of the whole country is strikingly barren and miserable. That this change of soil should be attended with so great a change in the vegetation, while that (more striking in a geological view) which takes place when we cross the Plata seems to have very little influence on it, is easily accounted for by the different relations of these soils to moisture. The surface of Patagonia, composed of loose shingle, is singularly dry; so much so, it is said, that one may travel for many days together without meeting with a drop of water: consequently, it is fitted for the growth of such plants only as can bear this remarkable degree of drought; and the character of the Patagonian Flora, as shown by all the accounts, is just such as we should expect under these circumstances. On the other hand, the clay and marl of the Pampas, and the soil, formed of decomposing granite, on the north side of the Plata, are both sufficiently favourable to the retention of moisture, and consequently to the growth of an abundant herbage.

To the northward, the Argentine region appears to have no very definite boundary, but to melt, as it were, into that of southern Brazil. About Porto Alegre, in Rio Grande do Sul, in S. lat. 30°, and consequently little more than four degrees north of Buenos Ayres, the botany has a thoroughly Brazilian character, notwithstanding the absence of great forests. There are abundance of large and showy climbers of a tropical aspect,—species of *Bignonia*, *Echites*, *Malpighiaceæ*, *Sapindaceæ*; of arborescent *Mimoseæ*; of shrubby *Compositæ*, belonging to the same genera, *Vernonia*, *Eupatorium* and *Baccharis*, which abound so much in tropical Brazil; and a vast profusion of Myrtles. The numerous Ferns of Rio Grande are almost all common to that district and Rio de Janeiro, and among them are two arborescent species, which contribute to give a tropical character to the Flora. Not a few phænogamous species, also, extend from the tropical parts of the South American continent as far as Porto Alegre; for example,—*Inga semialata*, *Mutisia speciosa*, *Baccharis dracunculifolia*, *Gaylussacia imbricata*, *Echites longiflora*, *Pleroma virgatum*, *Microlicia alsinefolia*, *Eryngium Pristis*, *Eriocaulon caulescens*; besides others which range still further south, to Monte Video, such as *Baccharis trimera*, *Pterocaulon spicatum*, *Achyrocline flaccida*, *Hydrocleis Humboldtii*, and various grasses.

On the other hand, the comparatively small number of *Melastomaceæ*, and the abundance of herbaceous and half-shrubby *Verbeneæ*, in Rio Grande, indicate the approach to the Argentine region. Some, indeed, of the characteristic species of Buenos Ayres, such as *Verbena erinoides* and *chamædrifolia*, range northwards as far as Porto Alegre. The considerable degree of difference between the vegetation of this latter place and of the northern shore of the Plata must, I conceive, be due to climate only, for there exists no natural barrier, and, as far as I can learn, there is no difference in the geological constitution of the country. I possess no precise information with respect to the climate of

* See Darwin's Journal of Researches, 2nd edit. p. 75.

Porto Alegre; but the fact mentioned by M. de St. Hilaire *, that the cultivation of mandioca and sugar extends so far south, and no further, seems to point it out as the southernmost limit of the seasons of tropical Brazil. Mr. Darwin has remarked the rapid change of climate in proceeding northward from Buenos Ayres, and in accordance with this, apparently, is the change of vegetation.

It would be interesting to compare the Flora of Chile with that of the Argentine region, but for this I have not sufficient materials. Meyen, in his 'Geography of Plants,' says that Chile and the countries on the eastern side of the Andes, in corresponding latitudes, cannot be considered as separate botanical regions; yet the information which he himself gives, in the same work, as to the Chilian Flora, seems to show that its general physiognomy is very different from that of the Argentine region. The accounts of many travellers show us that the climate and soil of Chile, in the latitudes of which I treat, are much more dry than those of the countries near the Plata, and this cannot fail to be attended with a considerable difference in the vegetation. The Chilian Flora, by Meyen's account, appears to be as strikingly characterized by dry shrubs with coriaceous and glossy leaves, as that of the Plata is by the prevalence of herbaceous forms. In the abundance of Myrtles, indeed, and of shrubby and arborescent *Compositæ*, the vegetation of Chile may be compared rather with that of southern Brazil. At the same time, the valuable catalogues drawn up by Sir W. Hooker and Dr. Walker-Arnott † show that many remarkable genera, and not a few species, are common to both sides of South America.

The Argentine Flora has little or no *general* analogy to that of the southern parts of North America lying in corresponding latitudes on the other side of the equator; yet there are some striking, though insulated, points of resemblance. There is a species of *Cephalanthus* on the shores of the Plata; there is an *Æschynomene* (*Æ. ciliata*, Vog.), excessively like the North American *Æ. hispida*; a *Pontederia*, extremely near to *cordata*, if not a mere variety of it; a *Sisyrinchium*, much resembling *S. Bermudianum*.

If we compare the Flora of the shores of the Plata with that of the Cape of Good Hope lying within the same parallels of latitude and having nearly the same mean temperature, we find an extraordinary difference between them. The many points of analogy, and the general physiognomical resemblance, between the vegetation of the Cape and of New South Wales have repeatedly been noticed; but between the botany of the Cape and that of La Plata we find scarcely anything but contrasts. It is not easy to discover any points of resemblance. The general physiognomy of the vegetation is different: the plants of the Argentine region are chiefly herbaceous, while at the Cape there is a great predominance of dry, hard, small-leaved shrubs. Almost all the characteristic families and genera of the two Floras are different: the *Solaneæ*, *Verbeneæ*, *Amaranthaceæ*, *Calyceraceæ*, *Helianthoid Compositæ*, *Pontederias*, *Jussiæas*, *Eryngiums*, and other forms which make up the most important part of the vegetation on the shores of the Plata, are wanting or insignificant at the Cape, which, as is well known, is characterized by *Proteas*, *Heaths*, *Diosmas*, *Pelargoniums*, *Mesembryanthemums*, *Aloes*, *Crassulaceæ*, and *Restiaceæ*; all of them absent, or nearly so, from the region of which I here treat. *Leguminosæ* are abundant in both countries, but for the most part of different genera. Almost the only points

* Journal, 2nd edit. p. 128.

† See the Botanical Miscellany, vol. iii.

in the Argentine Flora which strongly remind us of South Africa, are several species of *Oxalis*, and some gay-flowered *Irideæ* and *Amaryllideæ* (*Cypella Herberti*, *Sisyrinchium Bonariense*, species of *Habranthus* and *Zephyranthes*), which decorate the banks of the Plata. The *Cacteæ* of the latter country are represented at the Cape by succulent *Euphorbias*; and the herbaceous and half-shrubby *Malvaceæ*, which are numerous at Buenos Ayres, have South African representatives in the *Hermanniæ*.

Another thing which strikes us when we compare the Flora of Buenos Ayres with that of the Cape of Good Hope is, that the former is much less peculiar in its character than the latter. The Argentine region, considered botanically, is recognized at once as a province of South America; all its characteristics are such as belong especially to that part of the world, while the botany of the Cape has little resemblance to that of the rest of Africa. The distinction will be very apparent, if we compare, on the one hand, the Flora of the Plata with that of tropical Brazil, and on the other, the Cape Flora with that of tropical Africa. The number of peculiar or *endemic* genera of plants in the Argentine region is comparatively very inconsiderable; at the Cape, remarkably large. The peculiar genera of the former region almost always consist of a single species, or of very few; several of the peculiar Cape genera are very rich in species. The number of species common to the shores of the Plata and the tropical parts of the same continent is considerable, while extremely few are common to the Cape and tropical Africa.

A part of these differences may be accounted for by the local circumstances of the two countries. The Cape of Good Hope, as a botanical region, is almost cut off from the rest of Africa by the great deserts which, to the north of the Orange River, stretch across so great a part of the continent. Even in the colony itself, the desert called the Great Karroo is known to set an absolute limit to the northward extension of several characteristic families*. Now there is no barrier of this sort on the eastern side of South America, where (excepting perhaps the case of Patagonia) the limits of the range of plants seem to be fixed by climate alone. Moreover, it is probable that the characteristic Cape plants, generally speaking, are of a more delicate constitution, and have less power of bearing change of circumstances, than those of Buenos Ayres; as may be inferred from the much greater difficulty of cultivating them in gardens.

Another difference that I may notice, between the Cape of Good Hope and Buenos Ayres, is that naturalized European plants do not play by any means so conspicuous a part in the botany of the former country as in that of the latter. A good number of introduced species have indeed established themselves in the neighbourhood of Cape Town, but they have not spread far, nor do they appear in any remarkable quantity, nor at all vie with (much less supersede) the original natives of the soil. It is not owing to the greater extension of European culture that these plants have been more widely diffused in the region of the Plata; for although a great part of that country might probably be found very fit for cultivation, the proportion of it which has actually been brought into that state is very minute indeed. The climate, from its greater moisture, may be more favourable to such plants than that of the Cape, but the chief cause of the difference is probably to be found in the soil.

* See Burchell's Travels.

Mr. Brown has indicated a few points of resemblance between the botany of Australia and that of the temperate parts of South America; but these all, I think, belong to Chile. On the eastern side of the continent, within the latitudes in question, I am not aware of any plant that can at all remind us of the Australian Flora. It is rather remarkable, that the *Protea* family, which occurs, though sparingly scattered, in Fuegia, Chile, Peru, Guiana, and tropical Brazil, seems to be entirely absent from the region of which I treat.

I shall conclude with a few remarks upon some of the families contained in the collections before me, and on the range of particular species.

Filices.—At Porto Alegre and one or two other points in the extreme south of Brazil, about 30° S. lat., Mr. Fox collected fifty-four species of Ferns. This collection strongly exemplifies the wide range of species in this family, pointed out by Sir W. Hooker and by Dr. Joseph Hooker; for nearly the whole are natives of tropical Brazil, and at least one-half of the number occur likewise to the north of the Equator,—in the West Indies, Caraccas, Guiana, or Mexico. Two extend even to Europe,—*Asplenium marinum* and *Osmunda regalis*. The Rio Grande specimens of this *Osmunda* agree perfectly with the ordinary British form.

Of the fifty-four Ferns, forty-nine belong to *Polypodiaceæ**; two to *Gleicheniaceæ*, two to *Schizæaceæ*, and one to *Osmundaceæ*. Two are arborescent, *Didymochlæna sinuosa* and *Alsophila armata*. This, I suppose, is the southernmost limit of Tree Ferns on the eastern side of South America.

Buenos Ayres is remarkably poor in this family of plants. During the month that I spent there, although I paid much attention to botany, I did not observe a single Fern; and in the collections made by Mr. Fox, who, I know, took particular interest in this family, I find only one† Fern from the south side of the Plata. This circumstance is not at all surprising, for the bare, level, shadeless, treeless plains of Buenos Ayres are peculiarly unsuited to the Ferns. And we may observe, that even where there is a warm climate and a tolerably large supply of atmospheric moisture, (for both these conditions exist at Buenos Ayres,) these plants do not seem to flourish unless there be shade and variety of surface. In accordance with this, is the absence of Ferns from the bare table-land of Mexico‡, and their great scarcity on the open *campos* of the interior of Brazil. The neighbourhood of Graham's Town, in South Africa, has a much drier climate than Buenos Ayres, yet the ravines and rocks there, affording shade and shelter from the wind, produce many Ferns.

Gramina.—Among the Grasses collected on the banks of the Uruguay and La Plata, I find the *Poaceæ* (according to the division established by Mr. Brown) to be rather more numerous than the *Paniceæ*; the former, however, including a few naturalized species. The comparatively small number of Grasses in the collection does not allow me to suppose that it is, in this respect, at all a fair representative of the vegetation of the Argen-

* I follow the arrangement of Mr. J. Smith, published in Hooker's Journal of Botany.

† This is a *Blechnum* (or *Lomaria*? for Mr. Fox's specimens have no fructification) which seems to agree with the description of *Blechnum auriculatum*, Cav.

‡ See Martens and Galeotti, Fougères de la Mexique.

tine region, the local conditions of which appear favourable to this family. I will therefore not attempt to estimate the proportional number of Grasses to other orders. I will merely observe, that, besides some European grasses evidently naturalized in that region*, there are some apparently indigenous species which have a very wide range. Such are *Cynodon dactylon*, which seems to be a native of all the warmer parts of the world, in both hemispheres; *Setaria glauca*, equally cosmopolite; *Setaria italica*, of which I have specimens from Louisiana as well as from the Uruguay, and which is stated to be a native of Europe, India and New Holland; *Eleusine indica*, which appears, from the localities given by Kunth, to have a vast range in the tropical and subtropical zones; *Polypogon monspeliensis*, which I have myself seen at the Cape of Good Hope and at Buenos Ayres, as well as in the south of Europe; *Stenotaphrum glabrum*, common to the Cape, Louisiana, tropical Brazil, and the northern shore of the Plata. The beautiful grass *Eustachys petræa* may be added, if the Cape plant be really the same with the South American, which does not seem quite certain.

Eriocauloneæ.—Of this family, so very numerous in tropical South America, and especially in the interior mountainous districts of Brazil, I find only one species in Mr. Fox's collections from the extreme southern part of that country. This is *Eriocaulon* (*Pæpalanthus*) *caulescens*, of which there are specimens from Porto Alegre, S. lat. 30°; I met with it in Minas Geraes, not far from S. Joao d'El Rey; and I have seen a specimen from Guiana in Sir J. E. Smith's herbarium.

Alismaceæ.—A fine species of *Sagittaria* is plentiful in the marshy pools near the riverside at Buenos Ayres; it is, I suppose, *S. Montevidensis* of Chamisso†, though it differs from his specific character in having the back of the leaf quite smooth. It certainly comes very near to *S. sagittifolia*, though much larger both in the leaves and flowers. The *downy* filaments of the stamens, and *yellow* anthers, seem, as far as I can judge, to furnish the most certain characters; for the leaves of our English Arrow-head are so very variable, that it is hardly safe to rely upon the distinctions afforded by their more suddenly and sharply acuminated lobes in the Buenos-Ayrean plant.

Compositæ.—The celebrated botanist, Schouw, has characterized the countries near the Plata as the "Kingdom of Arborescent *Compositæ*;" a title scarcely applicable, for these plants, like most others of the region in question, have for the most part a herbaceous character.

Here, as in South America generally, the *Compositæ* appear to be the most numerous family of plants; but I am not able to state their proportional numbers with precision. Almost all those of the Argentine region belong to the *Corymbiferæ* of Jussieu; the *Cichoraceæ* and *Cynareæ* hardly occur at all, except in a naturalized state. The *Labiatifloræ*, so characteristic of the western side of South America and of the Andes, are few and inconspicuous in this region. It is curious, that the genus *Mutisia*, which ranges all up the west side of the continent from southern Chile into New Granada, and is scattered also through Brazil, as far south as Porto Alegre, does not seem to extend to the Plata. I must own, however, that negative conclusions in such cases are a little uncertain, unless they rest upon the concurrent testimony of many observers.

* See before, p. 188.

† Kunth, Enumeratio Plantarum, vol. iii. p. 157.

The shores of the Rio de la Plata are characterized by many herbaceous *Helianthea*:—species of *Leighia*, *Verbesina*, *Bidens*, &c. The genera *Vernonia*, *Baccharis* and *Eupatorium*, so characteristic of tropical Brazil, extend into this region, but no longer in such amazing numbers. At the Cape of Good Hope, where the abundance of *Compositæ* is remarkable, the prevailing groups are for the most part different from those of Buenos Ayres; in particular, the Everlastings (*Helichryseæ*), so prodigiously numerous at the Cape, are comparatively scarce in the corresponding latitudes of South America. The universal genus *Senecio*, however, abounds in both countries.

It has been observed, that the species of this family have not in general so wide a geographical range as might have been expected, considering the facilities for dissemination afforded by their feathered seeds. Nevertheless, several of the *Compositæ* of the Plata are tropical species, and some even common to both hemispheres. *Bidens helianthoides*, a common marsh plant at Buenos Ayres, appears to be a native of Mexico, Guiana, and Chile. *Flaveria Contrayerba* is common to Buenos Ayres (Mr. Fox), Peru, and Mexico. *Achyrocline flaccida*, common at Rio de Janeiro, was observed by Mr. Fox to range all the way from that place to the north bank of the Plata, and was also found by Schomburgk in Guiana. *Gnaphalium Gaudichaudianum*, another native of Rio, is in Mr. Fox's collection from Monte Video. *Pterocaulon spicatum* appears to have much the same range as *Achyrocline flaccida*: I have specimens from British Guiana, Rio de Janeiro, Rio Grande, and Maldonado *. The first and last of these stations are separated by about thirty-seven degrees of latitude. *Baccharis trimera*, DeC., also appears to be widely diffused in South America: it is one of the most common plants all the way from the gold district of Brazil to the Serra da Estrella near Rio †; it has been found at Bahia and at St. Catherine's; Mr. Fox met with it at Monte Video as well as in Rio Grande; and it is probably the same species that is mentioned by Sir W. Hooker ‡ as found by Dr. Gillies in the Pampas of Buenos Ayres, and by Tweedie in Northern Patagonia. All these, however, are instances of diffusion in latitude: I have not found among the *Compositæ* of the Argentine region (excluding evidently naturalized plants) any that are common to more than one continent.

Asclepiadeæ.—This order is numerous in Rio Grande and the Argentine region, as it seems to be in South America generally, although these countries by no means rival the Cape of Good Hope in the abundance of Asclepiads. One species, the *Gomphocarpus fruticosus*, widely diffused over the warmer parts of the old world, occurs also, I believe, at Monte Video; at least the specimens gathered there appear to me undistinguishable from the Cape plant; but it may have been accidentally introduced to this locality. With the exception of this genus and *Cynanchum*, the Asclepiads of Rio Grande and the Plata all belong to strictly American forms, among which *Oxypetalum* predominates in number. I find in Mr. Fox's collection only one species of *Asclepias* (*A. citrifolia*?); the *A. Curas-*

* The specimens from Maldonado have narrower and more pointed leaves than the others, but Sir W. Hooker named them *Pt. spicatum*, without any indication of doubt.

† It is certainly the *B. genistelloides* of Spix and Martius's 'Travels in Brazil.' Is it really distinct from the true *B. genistelloides*?

‡ Journ. Bot. vol. iii. p. 42.

savica, so common on the coasts of tropical Brazil, does not, apparently, extend much beyond the tropic.

Umbelliferæ.—These plants, observed by Humboldt to be very rare within the tropics, unless at great heights, seem to be pretty numerous in the subtropical zone of the southern hemisphere, but mostly of rather peculiar forms. The *Umbelliferæ* of La Plata and Rio Grande belong chiefly to the genus *Eryngium*, and especially to that curious section of it with long, narrow, linear or sword-shaped, parallel-veined leaves (or *phyllodia*), which are often fringed with bristles, or with bristle-like teeth. In Mr. Fox's collections from those countries, I find nine species of *Eryngium*, of which five belong to the parallel-veined section. One of them (*E. aquaticum*?) is a stately plant, 5 or 6 feet high, a conspicuous ornament of the marsh ditches near Buenos Ayres, with leaves that remind one of a *Bromelia* or *Pandanus*. Another (seemingly *E. Pristis*) extends from the tropical regions of Brazil as far as 30° S.; it is very frequent on the *campos* of Minas Geraes (about 20°–21° S.), at the elevation of 2000 to 3000 feet, while in Rio Grande Mr. Fox seems to have found it at a comparatively low level. Many *Eryngiums* of the same group, and, as it appears, nearly allied to these South Brazilian kinds, were found by Humboldt and Bonpland on the high lands of Mexico, and there are several in Chile.

I find very few other *Umbelliferæ* from the Argentine region in the collections before me. This part of South America seems to be destitute of those curious *Mulineæ* (*Bolax*, &c.) which are so characteristic of Fuegia, the Chilian Andes, and the Falkland Islands.

At the Cape of Good Hope, in corresponding latitudes, we find very different forms of this, as of most other families. That country has no *Eryngiums*, and I believe only a solitary representative of that division of the order, the *Alepidea ciliaris*. It has, however, a considerable number of *Umbelliferæ*,—not less than 120 species, according to Harvey,—and among them several peculiar genera, of which *Hermas* and *Arctopus* are the most singular; likewise many remarkable forms of *Hydrocotyle*, which seem in a manner to represent the South American *Mulineæ*.

Several European *Umbelliferæ* have become naturalized at Buenos Ayres, and among these the common Fennel is extremely conspicuous, covering the banks of earth between the cultivated fields in immense profusion, and forming a distinctive feature in the scenery. I have heard it remarked, by residents in that city, that when the wind called the Pampero, which blows over the inland plains, is coming on, its approach is always announced by the smell of *Fennel*, which it brings from the beds of this plant that it passes over. Mr. Darwin observed the range of the Fennel to be limited on the south by the Rio Salado, rather less than 100 miles south of Buenos Ayres.

Malpighiaceæ.—This is one of the characteristic tropical American orders which die out rapidly in proceeding towards temperate latitudes. Two species only, as far as I know, are found on the south side of the Plata, namely *Stigmaphyllon littorale* and *Heteropterys glabra*. In Rio Grande, Mr. Fox collected nine *Malpighiaceæ*, of which one is a *Galphimia*, the rest belong to *Banisteria*, *Stigmaphyllon*, and *Heteropterys*.

Tropæoleæ.—*Tropæolum* (*Chymocarpus*) *pentaphyllum*, abundant in the hedges about Buenos Ayres, seems to be the only plant of this order on the eastern side of temperate South America. Its head-quarters are evidently on the western side of the continent.

Œnothereæ (Endl.).—Of the four principal genera of this family, *Jussiæa*, *Œnothera*, *Epilobium* and *Fuchsia*, the Argentine region possesses only the first two. Some species of *Jussiæa* are plentiful on the marshy shores of the Plata, but as the genus has its head-quarters within the tropics, so it is richer in species at Porto Alegre than at Buenos Ayres. From this latter place I possess three species of *Œnothera*. *Fuchsia*, so characteristic of the west side of South America, seems, on the eastern side, to be confined to *tropical* Brazil.

Melastomaceæ.—One species only (as I have already mentioned) extends as far south as the Rio de la Plata, but does not appear on the southern bank of that river. Even in Rio Grande, the plants of this order are few when compared with their abundance in tropical Brazil, and when compared also with the allied family of Myrtles. I am aware of only nine species from the southern extremity of Brazil.

Leguminosæ.—The Argentine region is not particularly rich in these plants; at least, they by no means form so important a part of the vegetation as in tropical Brazil, in the south of Europe, or in Australia. The *Leguminosæ* of the region in question belong, with few exceptions, to genera widely diffused, such as *Crotalaria*, *Lupinus*, *Tephrosia*, *Indigofera*, *Desmodium*, *Æschynomene*, *Lathyrus*, *Clitoria*, *Cassia*, *Mimosa*, *Inga*, *Acacia*. This is quite a contrast to what is observable at the Cape of Good Hope, where the number of peculiar or *endemic* genera of this order is remarkably great. The observation which I have already made, as to the small number of peculiar forms in the Argentine Flora, when compared with that of the Cape, is particularly exemplified in this important family. The same holds good, perhaps in a still greater degree, if we compare it with the Flora of corresponding latitudes in Australia. It may be observed, also, that the greatest part of the *Leguminosæ* of the Plata belong to genera which are principally tropical, and which only straggle, as it were, into cooler latitudes; such are all but two, or perhaps three, of the genera mentioned above, One is almost tempted to say that the vegetation of this region is a mere modification, a reduced or dwindled form, of the Brazilian, instead of being a separate and strongly marked Flora like that of the Cape.

Again, at the Cape, the *Loteæ* predominate remarkably over the other papilionaceous tribes; in the region of the Plata, the *Hedysareæ* and *Phaseoleæ* are at least equally numerous. *Cæsalpineæ* and *Mimoseæ* are more numerous on the banks of the Plata than in the same latitudes in South Africa. In that country, south of the Orange River, I know of only two species of *Acacia*, although these are so abundant (one of them especially) as to give a distinctive character to the scenery; nor, as far as I am aware, are there any other *Mimoseæ* south of the same river, although, to the north of it and at Natal, (about the latitude of the southern extremity of Brazil,) they become numerous. Mr. Fox's collections from Buenos Ayres and Uruguay (between 33° and 35° S. lat.) include five species of *Mimosa*, one of *Desmanthus*, two of *Calliandra*, and five of *Acacia*; yet none of these are so abundant as to form characteristic features of the country, like the *Acacia horrida* and *Caffra* in the eastern part of the Cape colony. The *Cæsalpineæ* of these latitudes are principally *Cassiæ*, of which there are several species at Buenos Ayres. The magnificent *Poinciana Gilliesii* is said not to be indigenous there, though now well established on the banks of the Plata.

Daubentonia punicea, stated by Cavanilles to be a native of "New Spain," was observed by Mr. Fox to grow wild, sparingly, on the bank of the Rio de la Plata, below Buenos Ayres, and in great abundance and beauty on the banks of the Uruguay, near its mouth. It is certainly quite possible that the plant may be common to both countries, but it is also, I think, possible that Cavanilles, who saw it only in a botanic garden, may have been misinformed as to its native country, and that the Argentine region may have an exclusive claim to it.

Several European *Leguminosæ* are naturalized at Buenos Ayres; they are chiefly *Trifolieæ*, in particular *Medicago sativa* and *denticulata*, *Trifolium repens*, *Melilotus parviflora*.

Indigofera Anil, apparently a general plant thoughout the hotter parts of America, was observed by Mr. Fox to be common all through South Brazil and the Banda Oriental, but not to occur south of the Rio de la Plata. *Æschynomene ciliata* ranges at least from Guiana to Buenos Ayres, and, as Mr. Bentham observes, it is scarcely distinguishable from the North American *Æ. hispida*, which is found as far north as Philadelphia. Another *Æschynomene*, from Buenos Ayres, seems to agree with the *Æ. conferta* from British Guiana.